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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/765,881	01/29/2004	Toshiyuki Suzuki	2635-200	2291

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EXAMINER	
OLSEN, KAJ K	
ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/765,881	SUZUKI ET AL.	
	Examiner	Art Unit	
	KAJ K. OLSEN	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *See Continuation Sheet* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *See Continuation Sheet* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10-29-2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims pending in the application are 1,3,5,7,11,13,17,19,23,25,27,29,31,33,35,37,39,43,47,49-51,53,59,61,67,69 and 75-98.

Continuation of Disposition of Claims: Claims rejected are 1,3,5,7,11,13,17,19,23,25,27,29,31,33,35,37,39,43,47,49-51,53,59,61,67,69 and 75-98.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, 5, 7, 11, 13, 17, 19, 23, 25, 27, 35, 37, 39, 43, 45, 47, 49-51, 53, 59, 61, 75-85, 89-92, and 94-97 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Suzuki et al (USP 6,478,940) (hereafter "Suzuki '940"). Suzuki '940 is being cited and relied on for the first time with this office action. Its use here was necessitated by the applicant's significant amendments to the claims.

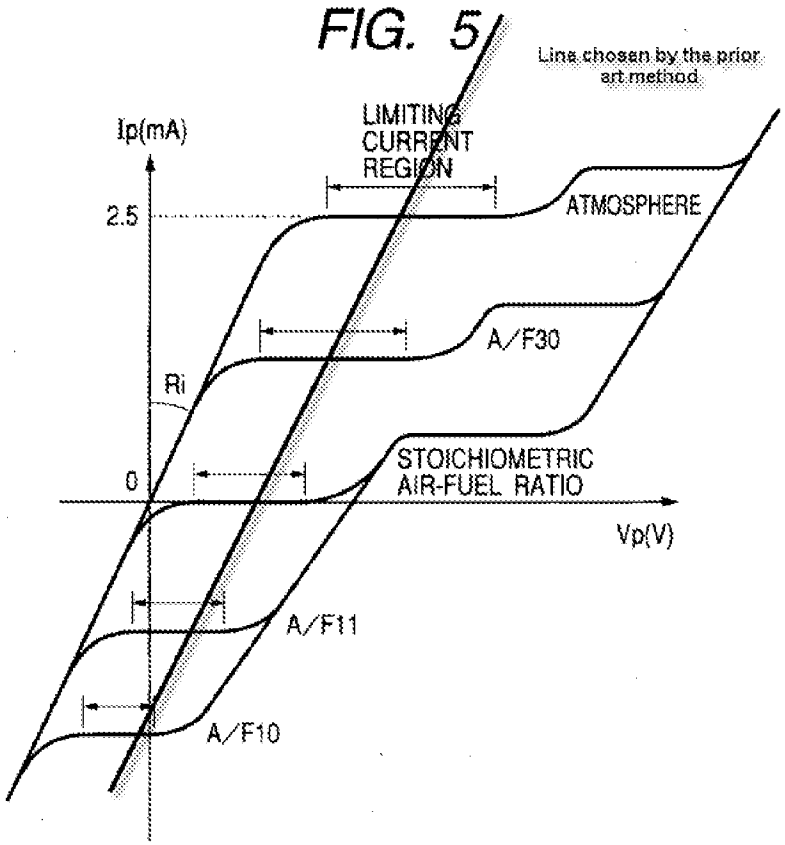
3. Suzuki '940 discloses a gas concentration detecting apparatus for use in a limit-current type gas concentration sensor having a sensor element including a solid electrolyte 11 and a pair of electrodes (16, 17) interposing said solid electrolyte therebetween (fig. 2). The apparatus of Suzuki includes an element current detecting unit (fig. 1) connected to said electrode that detects an element current outputted from the sensor element within a gas concentration range set widely, an applied voltage control unit, connected to said electrodes of said sensor element that defines a characteristic of the applied voltage so as to linearly change the applied voltage with the element current detected in said detecting unit along an applied voltage line L1. See fig. 3 and col. 5, ll. 3-16. With respect to setting a limiting current region within a voltage range, fig. 3 shows that the choice of applied voltage line is between the defined first and second voltage

points for each level of the specific component concentration (compare fig. 3 of Suzuki '940 with fig. 6 and 7 of the present invention). Suzuki '940 further discloses that the voltage level range is changeable with a temperature of the sensor element due to a sensor output characteristic changing with the temperature of the sensor element. See fig. 8 and 9 and col. 16, l. 1 - col. 17, l. 8. Because Suzuki '940 both chooses an applied voltage line that passes through the limiting current region for each specific concentration (see fig. 3) and teaches the use of different applied voltage lines for different temperatures (fig. 8 and 9), then the apparatus of Suzuki adjusts the applied voltage to pass through every limit current region and with a temperature considered voltage level range and controls the applied voltage. See col. 5, ll. 3-17 as an example.

4. With respect to the specified upper and lower limit points, it would appear that the dots on fig. 3 at A/F = 18 and A/F = 12 along line L1 would read on the defined upper and lower limit points.

5. With respect to the voltage control unit dividing the gas concentration detection range into a plurality of portions, the examiner notes that this limitation is drawn not to the apparatus *per se*, but rather to the procedure utilized to configure the apparatus. In particular, the apparatus comprises in part resistors R1-R3 that were chosen through a configuration process to create a line that extends through points b3 and a3. See p. 19, l. 25 - p. 20, l. 2 for a discussion of how R1-R3 define line RG and p. 24, l. 18 - p. 25, l. 11 for a discussion of how the division occurs only during a step to determine the choice of RG. Because the line L1 of Suzuki '940 passes through an intermediate point at each A/F ratio (fig. 3), it meets the claims regardless of whether this line was chosen through a process of dividing gas concentration detection range. The

division of the portions occurs not in the apparatus but when the apparatus does not appear to have any active function drawn to the set forth division of the claims. Similar to the discussion in the previous office action with Okazaki, a line chosen by the prior art method of Suzuki '940 (utilizing either the DC impedance (fig. 3, 4, 11, or 18) or the AC impedance (fig. 5-8)) would have resulted in an applied voltage line that extends through all of the detection regions of applicant's fig. 5. See the modified fig. 5 from the previous office action below, which also corresponds to a line chosen by the method of fig. 3, 4, 11, and 18 of Suzuki '940 as well. A line slightly steeper (not shown) would correspond to a line chosen by the method of fig. 5-8 of Suzuki '940 and would also extend through all of the limit current regions.



Whether or not this line is chosen by assigning a line from divided regions as in the present claims or whether this line is chosen based on the DC and AC impedance (as in Suzuki '940) does not further define the actual line itself or the apparatus itself.

6. With respect to the apparatus determining a limit current region based on a variation of element current or sets a point at which the element current increases due to a residue, these limitations also do not appear to be further defining the apparatus *per se*, but rather the parameters utilized to determine applied voltage line. As before, whether or not this line is chosen by the set forth process or whether this line is chosen by a prior art method does not further define the actual line itself or the apparatus itself.

7. With respect to the use of different applied voltage characteristics depending on whether the widths of the limit current region are the same or different, that also appears to only further describe how the applied voltage line is chosen and does not further define the actual line itself or the apparatus itself. Moreover, the line chosen for L1 in fig. 3 is centered in the middle of all the various limit current regions for the sensor based on the presumption that the widths of each limit current region is substantially similar. By centering the line in the middle of each region would provide the most protection from being near the ends of the limit current region for the sensor. In the event that these limit current regions widths were not the same (as shown in fig. 5 and 6 of the present invention), one possessing ordinary skill in the art would have been clearly motivated to utilize an alternate line that better centers the line in each characteristic region of the sensor such that one doesn't operate the sensor too close to the edges of the limit current region. Using the modified fig. 5 picture above, the use of a line based on the DC resistance from the sensor profile above would place the line somewhat close to the edge of the limit

current region for A/F = 10. One possessing ordinary skill in the art would have recognize that a shallower line than the one proportional to Ri would have better centered the sensor response into the middle of the narrow limit current regions of the sensor at the lower A/F ratios and would have prevented inaccurate measurements. See for example, fig. 7 and col. 16, ll. 1-21 where Suzuki '940 is attempting to avoid the use of a line that doesn't intersect at a point P2 off of the limit current region.

8. With respect to determining the use of voltage level ranges for minimum and maximum temperatures obtainable, Suzuki '940 already taught the use of different voltage ranges for different temperatures (col. 9, ll. 14-25). Although Suzuki '940 did not specify that these voltage ranges would account for the minimum or maximum temperatures attainable in the environment, one possessing ordinary skill in the art would have been motivated to include all possible temperature ranges for the selected voltage lines so as to have available all possible voltage lines for all possible temperatures.

9. With respect to the use of an estimated output characteristic after a variation with time, this is again defining how the applied voltage line is to be determined without explicitly defining that the determined applied voltage line is any way different from the prior art applied voltage line. For example, the examiner presumes this variation with aging would result in the applied voltage lines being shallower. However, Suzuki '940 teaches the preferred use of an applied voltage line (Lc) proportional in slope to the AC impedance of less than 80 Ω (see col. 15, ll. 49-60), but also teaches the use of applied voltage lines such as La, Lb, or Ld, which all have shallower slopes than Lc (fig. 6 and 9). Whether these lines are shallower because of DC resistance or temperature considerations or because of aging of the sensor doesn't appear to

constitute any difference in the apparatus itself, but only the rationale for the shallower line itself.

10. With respect to the use of feedback control for the applied voltage circuit, see col. 2, ll. 20-35.

11. With respect to the use of a voltage change regulating means, see col. 8, ll. 20-49.

12. With respect to the A/F ratio lean side limit of 20 or more or atmospheric, fig. 11 of Suzuki '940 shows the measurement extending all the way to A/F=30. Okazaki evidences that atmospheric pressure is equivalent to A/F of 27 and above. See fig. 8.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 1, 3, 5, 7, 11, 13, 17, 19, 23, 25, 27, 35, 37, 39, 43, 45, 47, 49-51, 53, 59, 61, 75-85, 89-92, and 94-97 in the alternative are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki '940 in view of JP 08-029,388 (hereafter "JP '388"). JP '388 is being relied on for the first time with this office action. Its use here was necessitated by the applicant's significant amendment to the claims.

15. With respect to the claims in the alternative, throughout these claims discussed above, applicant has limitations drawn to the manner in which the applied voltage line was chosen (e.g. dividing the concentration range into portions, where the widths of the limit current regions are

different, etc.). In each case, the examiner indicated that the manner that the line was being chosen did not further defined the actual line or the apparatus itself, unless applicant explicitly defines the chosen line in a manner that reads free of the lines chosen by Suzuki '940. See the discussion above. However, even if the examiner were to interpret the reasons for utilizing the various lines as further defining either the lines or the apparatus itself, then many of these choices of lines would be obvious over the further teaching of JP '388. In particular, JP '388 recognized that the gas concentration detection range should be divided up into a plurality of portions to ensure that the voltage utilized at each current was within the limit current region for that current. JP '388 also recognized that the width of the limit current regions may be different at different A/F ratios with the width being narrower at rich levels in comparison with lean levels. In response, JP '388 suggested the use of an applied voltage line that was overall shallower than the line that would correspond to resistance governing region relied on by Suzuki '940. Compare fig. 4 and 7 and see paragraphs 0019-0022. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of JP '388 for the apparatus of Suzuki '940 in order to ensure that the choice of voltage for each current point is safely with a limit current region for that current.

16. Claims 29, 31, 33, and 86-88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki '940 or Suzuki '940 in view of JP '388 as applied above, and further view of Okazaki et al (USP 5,993,641).

17. With respect to claims 29 and 86, Suzuki '940 or Suzuki '940 and JP '388 did not explicitly disclose that the applied voltage line and the characteristic line do not intersect with each other. Okazaki teaches that when the measured current exceeds either 20 mA or -21 mA,

the applied voltage line should be locked at V=0 or 0.9 V respectively. See fig. 11 and col. 14, ll. 44-63. Both of these applied voltage lines would not intersect the characteristic line for the sensor. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize a non-intersecting applied voltage line where the measured current is in excess of a particular value, as taught by Okazaki, for the sensor of Suzuki '940 or Suzuki '940 and JP '388 in order to prevent excessive current from being applied to the sensor (see Okazaki col. 15, ll. 1-25).

18. With respect to claims 31, 33, 87, 88, this modification to the voltage control unit is to utilized when the element current is outside of a defined range and thereby suppresses excess voltage application. See the preceding paragraph.

19. Claims 67, 69, 93, and 98 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki '940 or Suzuki '940 in view of JP '388 as applied to the claims above, and in further view of Suzuki et al (USP 4,664,773) (hereafter "Suzuki '773").

20. With respect to claims, Suzuki '940 or Suzuki '940 and JP '388 set forth all the limitations of the claims, but did not explicitly recite the presence of a rich side limit to the air-fuel ratio range set at 11 or less. Suzuki '940 appears to show a limit of 12 but doesn't specify any criticality for the choice of that ratio. Suzuki '773 teaches that limit current sensors can be utilized all the way down to a λ of 0.5 (A/F of about 7.3). See fig. 5. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Suzuki '773 for the apparatus of Suzuki '940 or Suzuki '940 and JP '388 so as to extend the utility of the sensor down to even A/F ratio detection range down to even richer exhaust gasses.

Response to Arguments

21. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. The new grounds of rejection was necessitated by the significant amendment to the claims.

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KAJ K. OLSEN whose telephone number is (571)272-1344. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kaj K Olsen/
Primary Examiner, Art Unit 1795
June 6, 2008